Remarks/Arguments

A. Examiner's Remarks

Claims 17-20 were rejected under 35 U.S.C. § 102(e) as being unpatentable over USPN 5,617,060 to Wilson et al (hereinafter Wilson).

Claim 21 was objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

B. General comments

Claims 17-21 remain in this application. No claims have been amended or newly added in this response.

C. Interview with Examiner Bayard on 6/21/04

The Applicants' agent, Judy Shie, had a phone conversation with Examiner Bayard on 6/21/04 regarding the cited reference of Wilson, and discussed claim 17. However, no agreement was reached regarding the claims.

Expectation function

During the interview, the Examiner objected to the use of the phrase "applying an expectation function" as used in claim 17 because the Examiner thought it was too broad and encompassed almost any function. The Examiner requested a better definition for "expectation function".

The expectation function, E(X), is a well-known function in statistics. It is the way to determine the expected value for X, where X is a random variable. There is a well-known and strictly defined formula to determine the expectation function E(X):

$$E(X) = \int_{-\infty}^{\infty} tf(t)dt$$

where f(t) is the probability density function of the random variable X. See Exhibit A, page 157 of Mathematics Dictionary, 5th edition, by Robert C. James (NY, Van Nostrand Reinhold © 1992, ISBN 0-442-01241-1). See also Exhibit B, pages 126-128 (especially equation 3.57 on page 127) of Probability and Random Processes for Electrical Engineering, 2nd Edition, by Alberto Leon-Garcia (Addison-Wesley Publishing Company, Inc, © 1994, ISBN 0-201-50037-X).

The probability function f(t) will differ depending on the distribution of random variable X. In the present invention, it is known that there is a Gaussian probability distribution for the noise. The probability function for a Gaussian distribution is:

$$f_X(x) = \frac{e^{-(x-m)^2/2\sigma^2}}{\sqrt{2\pi}\sigma} \qquad -\infty < x < +\infty \quad and \quad \sigma > 0$$

See Exhibit C, page 101 of Probability and Random Processes for Electrical Enineering, 2nd Edition, by Alberto Leon-Garcia (Addison-Wesley Publishing Company, Inc, © 1994, ISBN 0-201-50037-X).

When this probability function is plugged back into the expectation function above, the result is the expected value for X, when X has a Gaussian probability distribution:

$$E(X) = \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}\sigma} |x| e^{-(x-m)^2/2\sigma^2} dx$$

This is the formula derived on page 9 of the present invention, where the random variable is $n1_I$, the real part of the noise power.

Therefore, there is a well-known and well-defined formula to determine the expectation function, and consequently it is not an overly vague or broad limitation to be used in claim 17.

D. 35 U.S.C. §102(e) - claims 17-21

Claims 17-20 were rejected under 35 U.S.C. § 102(e) as being unpatentable over USPN 5,617,060 to Wilson.

On column 11, lines 9-20, Wilson teaches approximating the signal power by using the formula LOG(MAX{ABS(I), ABS(Q)}). Breaking the formula down, Wilson does teach taking the absolute value of I and the absolute value of Q. However, Wilson does not add the two absolute values together. Instead, Wilson picks the larger of the two values |I| and |Q|, and then takes the logarithm of the larger value. There is no expectation value taken either.

In distinct contrast to Wilson, the present invention teaches a power approximation circuit that avoids calculating squared terms. First, the power approximation circuit calculates the sum $|I|+|Q|$ (page 17, lines 11-22). Then, an expectation function is applied to that sum to produce an approximation for the power of the complex signal (page 11, lines 24-28). However, Wilson does not teach combining the absolute values of |I| and |Q|, nor does Wilson teach an expectation function. This unique and patentable feature can be found in claim 17 of the present invention: "... the power approximation circuit generating an approximate power value which indicates an actual power value for the complex signal by <u>combining absolute values of the real and imaginary components and then applying an expectation function to the combined absolute values</u>" (underlining added).

Claim 17 is believed to be patently distinct over Wilson. Therefore, claim 17 is believed to be allowable. Dependent claims 18-21 are believed to be allowable based on the allowability of claim 17.

No new matter has been introduced with this amendment. The rejections to claims 17-20 and the objection to claim 21 are believed to be overcome.

Conclusion

If there are any further questions or if more discussion is required, the Examiner is invited to call the Applicants' agent at the telephone number given below. In view of the above, the claims presently in the application are believed to be distinct over the cited references and in condition for allowance. Accordingly, it is respectfully requested that such allowance be granted at an early date.

Respectfully submitted,
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